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The British War Effort

Now that the Government has issued the " White Paper on Statistics Relating to the War Effort of the United Kingdom," it is possible to obtain a picture of the part played by the foundries. The picture, however, is still very incomplete, because of the lack of sub-division into wrought and cast products. However, the following generalities can be deduced: (1) The steel castings industry has grown to such an extent that all peacetime output records have not been merely overtaken, but have been doubled or even trebled. Factors contributing to this estimate are the increase in bomb production from 48,300 tons in 1940 to 227,800 for the first half-year of 1944; tank and armoured car output has risen in the same period from 7,441 to 16,421. Shipbuilding statistics show the same trend, whilst the demands for steel castings from the mines, railways, and transport industries have not been light. (2) The non-ferrous foundry industry is now probably employing more labour than the ironfoundries. This is primarily due to the expansion in the light alloy section catering for the aircraft industry. The number of castings used in a heavy bomber is of the order of a thousand, and as the production of this class of aeroplane has risen from an output of 41 in 1940 to 2,889 in the first half of this year, the effect on the foundry industry can well be imagined. Naval orders have had a profound influence on the foundries turning out the copper base alloys. The size of the orders to be executed, has caused the transfer of many components from the sand floor to the die-casting department, and in this field Great Britain probably leads the world. (3) The weight of iron castings made is probably of the order of peacetime production, but the value is obviously much higher as the volume of machine-tool work and high-duty irons in general has increased, whilst cast-iron pipe, builders' castings have been only in very restricted quantities.

It is interesting to note that it is the opinion of Mr. J. H. Van Deventer, the Managing Editor of the " Iron Age," as a result of an extended tour of our industries, that the prospects for the post-war export of British machine tools is distinctly good because the American employers do not pay their staff by results. On the other hand, he gives but little hope of this type of business for motor-cars, because the whole domestic production of Great Britain if concentrated into one American works would scarcely be sufficient to keep them out of the bankruptcy court! The ironfoundries have achieved excellent productions by means of a novel plant of such items as smoke bomb cases and incendiary bomb components. The latter job was originally carried out as a drop forging, but it was quickly found that the necessary dimensional accuracy could be achieved as a casting. The light-castings side of the iron-foundry industry has been very badly hit. Their staffs have been dispersed, and other lines of business have had to be undertaken. A typical case is one where a peacetime staff of ninety moulders has been reduced to thirty. Again, only a " handful " of baths is now being made by a concern whose pre-war production was over four figures weekly. Since housing has become priority No. 2, the same effort will have to be put into the reconversion of these foundries as was the case with their conversion to war industries.

The foundry industry can derive much satisfaction from the White Paper. Though but little direct reference is made to the accomplishments of the foundries, there are, by reference to the statistics of related industries, and the production of the implements of war, grounds for real satisfaction at having done a major share in a truly gigantic job. Moreover, other statistics show very clearly that life on the home front has been far from gay during many long periods of this five-year-old war.

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NOTES FROM THE BRANCHES

Lancashire Branch.—At a meeting held at the Engineers' Club, Manchester, on October 14, Mr. A. Hopwood, the president, said he had the very pleasant duty to perform of presenting Mr. E. Longden (Manchester) with a share of the British foundrymen's award. Mr. Longden, in acknowledging the receipt of the award, said he did not desire to conceal the pleasure it gave him to share in the honour of the first award of the British Foundry Medal, especially since he was in a position to state that there were so many excellent Papers worthy of similar recognition. It might well be said that no matter in what worthy piece of work one might be engaged everything that was good in a man thrived best when properly recognised. Mr. Barrington Hooper, the donor of the award, was to be congratulated on his choice of the title, "The British Foundry Medal." It sounded right in a foundryman's ears. All of them hoped that in spite of the very wide interpretation placed on the term "foundryman" nowadays, that in the years to come a large number of truly technical practical men would qualify for and receive the British Foundry Medal. In particular, it would give the Lancashire Branch Council great satisfaction to find that an increasing number of the Branch members were aspiring to win and receive their share of such honours.

It could be anticipated that the British Foundry Medal, by virtue of its qualifying name, and the wish of the donor, would become the most coveted of the awards made by the Institute. Mr. Longden said another angle for consideration was that the effort of compiling an essay or treatise explanatory of some serious subject would prove to be one of the greatest educational factors in the life experience of any individual. He used the term "serious subject" because in the words of a great philosopher, "The man who writes for fools is always sure of a large audience." In the case of the Lancashire Branch they rarely had what the general public would refer to as large audiences, but they were certainly quality audiences. He accepted the cash award as a token of the value placed on the Paper.

Then followed a lecture on "Patternmaking" by Mr. W. C. Perry, A.M.I.Mech.E., partner in the firm of G. Perry & Sons, of Leicester. A report of this discussion will be published in a future issue

West Riding of Yorkshire Branch.—Members are invited to submit entries for the S. W. Wise Memorial Prize, which is awarded annually. On this occasion the subject selected is "Post-war Prospects of the Foundry Industry," concerning either (*a*) "Industrial applications of castings," or (*b*) "The application of new methods of castings production." Entries are to be forwarded to the Branch Hon. Secretary not later than February 10, 1945, and conditions governing the award may be obtained from him.

The first annual general meeting of the Scientific Film Association was held on November 25, at the Bonnington Hotel, London, and was followed by a film show.

INSTITUTE OF BRITISH FOUNDRYMEN

Mr. J. W. GARDOM'S STUDENTS' FUND

It will be recalled that at the annual meeting of the Institute of British Foundrymen in June last, it was announced that the Council had accepted from the President, Mr. J. W. Gardom, a fund to enable a selected number of young foundrymen to attend Sub-Committee meetings of the Technical Council. It was intended that travelling and other expenses should be met from the fund, and it is now stated that 79 applications were received from all parts of the country.

It has been possible for the Council to award only five places at the present time, and the successful candidates are:—R. Gould (Brown, Lenox & Company, Limited, Pontypridd); H. Millar (Glenfield & Kennedy, Limited, Kilmarnock); W. Jones (Hepworth & Grandage, Limited, Bradford); W. D. G. Venn (Garton & King, Limited, Exeter); and F. Hallas (Kaye & Company (Huddersfield), Limited).

The task of selecting so small a number from such a large list of applicants has obviously been difficult, especially in view of the very high standard shown throughout. The Institute hopes that those who have been unsuccessful will not be discouraged by the result, and that further opportunities will present themselves to enable them to participate as closely as possible in the activities of the Institute.

FORTHCOMING EVENTS

DECEMBER 14.

Iron and Steel Institute:—Joint meeting with the Staffordshire Iron and Steel Institute, at the Dudley and Staffordshire Technical College, The Broadway, Dudley, at 7 p.m. "Development in the Design and Use of Side-blown Converter Plants," by P. C. Fassotte.

DECEMBER 18.

Iron and Steel Institute:—Joint meeting with the Cleveland Institution of Engineers, at the Cleveland Scientific and Technical Institute, Corporation Road, Middlesbrough, at 6.30 p.m. "Considerations on Blast-furnace Practice," by Dr. T. P. Colclough.

JANUARY 15.

Sheffield Society of Engineers and Metallurgists:—Annual general meeting and lecture on "Ship Model Testing," by A. Emmerson, of the National Physical Laboratory.

Institute of British Foundrymen

DECEMBER 16.

East Midlands Branch:—"Some Interesting Examples of Loam Moulding," by R. D. Lawrie. At the College of Technology, Leicester, at 6 p.m.

DECEMBER 18.

Sheffield Branch:—"Initial Experience in the Operation of the Hydro-blast Process in a Steel Foundry Fettling Shop," by F. N. Lloyd. At the Royal Victoria Hotel, Sheffield, at 7 p.m.

DECEMBER 22.

Falkirk Section:—"The Development and Production of Inoculated Cast Iron," by H. P. Hughes. At the Smoke Room, Temperance Café, Lint Riggs, Falkirk, at 7 p.m.

At the invitation of the Royal Photographic Society the British Council is exhibiting at the Society's premises at 16, Princes Gate, Kensington Gore, 150 prints, including a number of the steel and textile industries. Admission is free, and the exhibition will remain open during the month of December.

BRITISH CAST IRON RESEARCH ASSOCIATION

ANNUAL REPORT AND ACCOUNTS FOR 1943-44

The year ending June 30, 1944, now under review, terminated a five-year period for which the Association had grant arrangements with the Department of Scientific and Industrial Research, and in normal circumstances early in the year negotiations for the succeeding period would have been opened. The pre-occupation of both the industry and the Association, however, were matters arising from the war, and the desirability of seeing the termination of hostilities in Europe before outlining to members proposals for post-war extension, to which further reference is made below, induced the Council to ask the Advisory Council to the D.S.I.R. to extend the existing arrangement for one year, that is, to June, 1945. To this the Advisory Council kindly agreed, on the understanding, however, that proposals for the next period would be put before them in time to be given effect for the financial year beginning July, 1945. In view of this, the Council suggested, and members agreed, that the honorary officers be invited to continue in office for 1944-45, and they kindly consented. Since that time, however, the death of Dr. T. Swinden, Vice-President, has occurred, and in him the country loses an outstanding metallurgist and a delightful personality. His death is widely regretted.

Council and Officers

The annual general meeting was held in London on December 9, 1943. Mr. P. H. Wilson, O.B.E., Vice-President, presided in the unavoidable absence of Mr. P. Pritchard. The Council re-elected as chairman Dr. Harold Hartley, and four meetings have been held, together with seven meetings of the Executive Committee.

The last Report recorded the Council's decision to set up three main committees, the Research, Development and External Relations committees, and each of these committees has been considering post-war policy. The Research Committee has held four meetings, under the chairmanship of Dr. J. E. Hurst, J.P. Two meetings of the Development Committee have taken place, with Mr. P. H. Wilson as chairman and Mr. J. J. Sheehan as vice-chairman. This Committee reviews the work of the Development Department, and is considering the post-war programme of work to be carried out to make effective application in members' foundries of scientific work done in the laboratories of the Association or elsewhere. Two meetings of the External Relations Committee have also been held, under the chairmanship of Mr. T. M. Herbert. This Committee reviews the work of the Intelligence Department, including the library and the information bureau. It is also concerned with the publications of the Association, its public relations, education and other related matters. The reorganised sub-committees of the Research Committee have held four meetings, and the general quickening of interest is shown by the fact that since the close of the year twice as many meetings have been held compared with the corresponding period in the year under review.

Research

In the range of high-duty cast irons, work on the acicular irons has been continued, and optimum compositions for this complex alloy system worked out. Some information has been obtained on mechanical properties at elevated temperatures. It is proposed to complete one major section of this work by determining a wide range of engineering properties on commercially made material.

The collection of data on mechanical properties in relation to design continues, and during the year the Director lectured at three centres for the Ministry of Production on considerations to be borne in mind in the design of castings.

Work on the formation of graphite has been pursued with vigour, and, indeed, since the end of the financial year two meetings of the Research Committee have been devoted to reporting progress and promoting discussion on this work. Reports of work done on ladle additions and on induction hardening of cast iron have been completed and will shortly be available to members. Some delay in resuming work on non-metallic inclusions and on ingot mould material has been occasioned by difficulty in obtaining equipment and samples. The acquisition of equipment for spectrochemical analysis is now virtually complete, and a report has been issued on the application of the photoelectric absorptiometer to the analysis of cast iron.

In view of the shortage of linseed oil, work has been done on its partial substitution in core mixtures by petroleum extracts and a report issued. The final work is being issued at the request of the Petroleum Board as a Special Publication. The recommendations of the Joint Committee on Sand Testing are approaching completion in respect of the testing of greensands and clay-bonded dry sands, and a report will shortly be available. The work on core sand recovery from sands containing ash-bearing binders such as molasses and sulphite lye is approaching completion. By arrangement with the Joint Committee on Vitreous Enamelling, work on this subject was closed down during the year to enable the accommodation and equipment to be used for more urgent purposes.

The Association has maintained continuous contact with the Ministry of Supply on a variety of matters, and particular mention may be made of work done on the peeling defect in whiteheart malleable, on which two reports have been issued, and on the influence of residual elements on the properties of whiteheart malleable, a lengthy report on which is in preparation.

British Cast Iron Research Association

Development

The Development Department continues to assist members on foundry problems and difficulties and on the application of laboratory results to practice. This work involves visits on the part of the staff to members' foundries and discussions at headquarters visited by members. In some cases representatives of members are received for training. During the past three years the number of enquiries dealt with from members has averaged 1,250 per annum. This work not only represents a direct return to members for the subscription, but forms a most desirable direct contact between the staff of the Association and members, which is of great service in building up the research and development programme.

The Development Committee envisages expansion of the Department in the future. The Committee is conscious of the necessity for work which will enable castings to compete with alternative materials and for finding new uses for cast iron. There is great need for some means of expressing authoritative opinion on casting design and for the provision of data needed by engineers for use in design, doing, in fact, for engineering and industrial applications what the new department referred to below does for building and domestic uses. The Department has continued to house the work of the Ironfounding Industry Fuel Committee of the Council of Ironfoundry Associations.

Laboratories

Among the various laboratories and experimental departments of the Association are several in which the work required is of such volume as to justify a special staff, notably for chemical analysis, microscopic examination, mechanical testing and sand testing. Both the Research and Development Departments use the services of these laboratories, and before the war approximately two-thirds of the load on them was provided by the former and one-third by the latter Department. As the war progressed considerable demand arose for the conduct of tests from members without testing facilities and yet having to undertake manufacture of munitions and other components to specification. Various official bodies, the A.I.D., C.I.A., etc., also required independent tests. As a result, the number of tests passing through the laboratories showed a large increase.

In spite of the enlargement due to the research programme, the tests passing through the Development Department were such that the above proportions were reversed. The increase not only created staff problems, but complicated the difficulties in the way of wartime removal. The figures given below in the first column refer to the total number of tests passing through the four laboratories above-mentioned during the last six years, including both headquarters and Scottish laboratories. The figures for the latter have also been given separately to show that this laboratory has fully shared in the work of this kind. This work has played no small part in enabling the industry to make its contribution to the war effort.

	Total Tests.	Scottish Laboratory.
1938-39	20,100	3,000
1939-40	28,400	3,000
1940-41	35,700	6,700
1941-42	51,300	8,100
1942-43	53,600	13,700
1943-44	56,300	13,200

Intelligence

The "Bulletin" has appeared regularly, but in October, 1943, the issue of "Enamelling Abstracts" as a separate publication was discontinued. The amount of new work to be recorded ceased to justify separate publication.

The work of the library has continued, and loans of books, periodicals, pamphlets, averaged about seven per working day, and 175 enquiries were dealt with, requiring information available from published sources. These requests cover all types of enquiry—commercial intelligence, enquiries for practical information, technical information and bibliographies. During the year 16 research reports have been issued, together with 22 external reports and four translations.

Building Uses Department

During the year the Council had under consideration a scheme with the co-operation of the British Ironfounders' Association for establishing a Building Uses Department. The object of the Department is to provide an impartial source of information for architects, quantity surveyors, industrial designers, builders and others with respect to the building uses and applications of cast iron. The Department opened on July 1, 1944, with Mr. D. L. Bridgwater, F.R.I.B.A., as consulting architect, in charge. On various occasions, including the members' annual visit on June 28 and the visit to the Scottish laboratories on August 16, a small exhibit relating to the Building Uses Department has been prepared, and a more ambitious project is being arranged for the end of the calendar year, to form a basis for a permanent exhibition which can be shown at various centres.

Scottish Laboratory

During the year the laboratory has been entirely reconstructed and equipment largely increased, to enable it to deal with a much wider variety of problems and enquiries, involving chemical analysis, mechanical testing, micro-examinations, and sand and refractory material examinations. On August 16, 1944, a visit to the laboratories took place and a large number of members was shown the laboratory and the facilities available. Two reports have been issued to Scottish members in this connection. Mr. A. Woodburn, M.P., delivered the opening address, which was followed by an inspection and demonstrations. The Director subsequently spoke to members on the assistance the Association could give to the light-castings industry. The absence through indisposition of Mr. G. A. Ure, J.P., who, as chairman of the Scottish

Committee, had made the arrangements for the meeting, was regretted. As the figures show, the peak of work arising from the war has passed and the facilities are being applied to assist members in problems arising from the present and post-war development programme.

Accommodation and Equipment

During the year a small laboratory building at headquarters has been completed and brought into use. It has an area of approximately 1,800 sq. ft., and is divided into four laboratories with appropriate dark room accommodation. It is either equipped or to be equipped for spectrochemical analysis, vacuum fusion determinations, X-ray diffraction and mechanical testing, chiefly at elevated temperatures, including creep. Other equipment installed elsewhere in the building and not referred to above includes an electrical malleable annealing oven with a programme controller for predetermining the annealing cycle, a salt bath furnace and a cooling curve furnace.

On June 28 about 90 members visited the headquarters on the occasion of a members' visit to see work in progress. Visitors to the hall continue to average one to two per working day.

Finance and Membership

The statement of accounts shows another decided increase in income over the previous year and the highest total in the history of the Association. The assets of the Association in land, buildings and equipment are valued at £35,000 and the whole of these are written down to nil in the balance sheet.

The number of ordinary and trade members up to the end of October, 1944, is 516, and of associate members 38.

The increased income is due in part to the voluntary action of a number of members in raising their subscriptions for a three-year period, of which the year under review is the last. A list of these members was given in the last annual report and in the booklet issued for the official opening of the new premises in May, 1943. In addition, grateful acknowledgment must be made to Johnson's Iron & Steel Company, Limited, West Bromwich, and the Mirrlees Watson Company, Limited, Glasgow, together with the following overseas members:—Broken Hill Pty., Company, Limited, Melbourne, Australia; Arthur Butler & Company (Moz.), Limited, Bihar, India; Indian Malleable Castings, Limited, Calcutta; Indian Iron & Steel Company, Limited, Calcutta; T. Main & Sons, Pty., Limited, North Richmond, Australia; McPherson's Pty., Limited, Kensington, Australia; Royal Australian Navy, Sydney; Thompsons Engineering & Pipe Company, Limited, Castlemaine, Australia; and Wright & Company, Sydney, Australia.

The Future

The growth of the Association since 1938 is shown by the figures for annual income below:—1938-39, £18,213; 1939-40, £17,910; 1940-41, £18,080; 1941-42, £24,218; 1942-43, £28,983; 1943-44, £33,112.

Part of the increase is due to voluntary additions to subscriptions by members, part to new members, and part to increase in grant earned. Some income has also been derived from work specially requisitioned in connection with the war effort. The somewhat unstable situation, therefore, exists in which actual industrial subscriptions do not aggregate one-third of the total income. The Council feel that members wish the Association to be established on a firm basis, capable of giving the industry all the assistance that is required in promoting its post-war interests, by improving the material with which the industry is concerned to ensure its maximum use and effectiveness, and to enable it to compete with alternative materials. In order to do this it is evident that the Association must enlarge its accommodation and staff. An excellent beginning has been made in the acquisition of the new premises, where ample land is available, and important additions have also been made to equipment.

The Association has never been so fully representative of the industry as it is at the present time, with over 500 members. Such estimates of output as are practicable on data available, suggest that members of the Association in this country are responsible for about one-half the total output and under peace conditions are likely to produce more than this proportion. Before the war the annual output of the industry was conservatively estimated to be over two million tons, valued at forty millions sterling.

There is no doubt that this figure is to-day largely exceeded, and is likely to be exceeded after the war. If we may assume the basis adopted by the Federation of British Industries that 1 per cent. of the turnover of an industry should be devoted to expenditure on research and development, it is clear that the iron-founding industry could profitably expend, at a conservative figure, about £500,000 per annum, and of this a reasonable proportion for a co-operative research association for the industry is £100,000. The Council has, therefore, approved in principle of an increased income based on increased subscriptions and has given careful consideration to the most equitable method of securing this. When details are settled, it is hoped to advise members so that the new scale can be put into operation as from July, 1945, following negotiations with the Department of Scientific and Industrial Research with respect to grant. The immediate aim of the Council is an income which can be built up in a short period to £50,000 per annum.

The Council look forward to the time when founders, users of castings, suppliers of material and equipment to the industry will co-operate through the Association to place the industry on such a sure foundation of technical and scientific knowledge and experience, as will ensure its progressive development.

The Report is signed by Dr. H. Hartley, chairman of Council, and Mr. J. G. Pearce, director and secretary.

The order limiting the production of cast-iron kitchen utensils in America has been revoked since the supply of pig-iron is no longer critical. Production is not expected materially to increase, as most concerns are busy with war work; they can, however, now make any type they like.

B.C.I.R.A. ANNUAL MEETING

MR. PERCY PRITCHARD RE-ELECTED PRESIDENT

The 24th annual general meeting of the British Cast Iron Research Association was held at Grosvenor House, Park Lane, London, W.1, on December 6, Mr. Percy Pritchard presiding. After the secretary had read the notice convening the meeting, the PRESIDENT referred to the heavy loss sustained by that Association through the death of their vice-president, Dr. T. Swinden, and the members stood in silence as a mark of their respect.

In submitting the annual report and accounts the PRESIDENT referred to the comfortable balance the Association now possessed. This was due to increased membership, which implied the necessity for additional services in the future at extra cost. Both the report, which is printed elsewhere in this issue, and the balance sheet showed the Association to be in a thoroughly healthy state, and he had pleasure in proposing their adoption. Mr. G. R. Webster seconded, and the motion was carried unanimously.

Election of President

DR. HAROLD HARTLEY proposed the re-election of Mr. Percy Pritchard as President. In doing so he coupled with it a cordial vote of thanks for work the President had done for the Association in recent years, especially in connection with the acquisition of the premises at Alvechurch as central laboratories. Mr. Percy H. Wilson, O.B.E., seconded, and on being put to the meeting, the motion was carried with acclamation.

DR. J. E. HURST proposed, and MR. T. M. HERBERT, M.A., seconded, that Mr. J. F. Davies, Mr. J. E. Jobson, Mr. W. B. Lake, Mr. P. H. Wilson, and Mr. FitzHerbert Wright be re-elected vice-presidents. This was also carried unanimously.

On a proposition made by Mr. R. B. TEMPLETON, seconded by MR. F. ARNOLD WILSON, the following were re-elected members of council:—Mr. P. A. Abernethy, Dr. S. F. Barclay, Dr. C. H. Desch, Mr. V. C. Faulkner, Professor D. Hanson, Dr. Harold Hartley, Mr. T. Makemson, Mr. A. E. Pearce, Mr. N. R. Rees, and Mr. J. J. Sheehan. Mr. W. R. Blair, M.C., M.A., LL.B., was also elected a member of council. A formal resolution re-elected H. Overton, Salt & Company, chartered accountants, as auditors for the ensuing year. DR. A. B. EVEREST expressed the thanks of the members to the council and committees for their services during the year. Because of the recent reorganisation, the work of these bodies had been more than usually onerous. The PRESIDENT seconded Dr. Everest's motion.

DR. HURST proposed, and MR. FITZHERBERT WRIGHT seconded a vote of thanks to the chairman. Both stressed the value of the leadership he had given. In reply, MR. PRITCHARD referred to post-war problems and the expansion of the industry. He laid stress not on the provision of plant, which was relatively easy, but on the preparation of plans for the supply of craftsmen. There must be a united effort for the solution of this problem, in which the B.C.I.R.A. would play its

(*Continued at foot of next column.*)

AMERICAN FOUNDRYMEN'S ASSOCIATION

1945 CONGRESS AT DETROIT

The 49th annual meeting of the American Foundrymen's Association will be held in Detroit from April 30 to May 4, 1945. The event is announced as the Fourth War Production Foundry Congress, and the programme is being planned to stress the necessity of continued high production by the foundry industry even though "V-E Day" may precede the event itself.

It is expected that a number of important technical Papers will be presented at the meeting by outstanding metallurgists and operating men of the motor-vehicle industries centred in the Detroit area. Many important developments in foundry practice have been made in connection with the tremendous war production efforts of the local manufacturers. In tonnage of castings produced, Detroit has become one of the greatest foundry centres in America, and, censorship permitting, the availability of many plants for inspection trips by visiting foundrymen will add greatly to the interest of this meeting.

Each branch of the castings industry will be represented in the technical programme, with major emphasis placed on non-destructive testing methods, sand practice, melting operations and other phases of foundry work of greatest value to wartime industry. A feature will be the presentation of the 3rd A.F.A. Foundation Lecture, to be presented by Dr. H. A. Schwartz (E. J. Fox medallist), manager of research, National Malleable & Steel Castings Company, Cleveland, on "Solidification of Cast Metals." Dr. Schwartz is internationally known for his basic research in metallurgical fields, and the fundamental nature of his lecture should have universal appeal.

The selection of Detroit was made following an invitation of the Association's Detroit Chapter, of which Mr. R. G. McElwee, Vanadium Corporation of America, is chairman. Further assurance of a successful meeting may be gained from the fact that both the National President and Vice-President of A.F.A. are Michigan men—Mr. R. J. Teetor, of Cadillac Malleable Iron Company, Cadillac, Mich., and Mr. F. J. Walls of International Nickel Company, Detroit.

No exhibition is planned in connection with the 1945 meeting in Detroit, in view of the fact that the equipment and supply industry is expected to concentrate on plans for the 50th Anniversary Foundry Congress and Foundry Show of the Association, to be held in 1946.

(*Continued from previous column.*)

full part. He had noted with pleasure the increasing membership of the Association, but he was still not satisfied. What would achieve complete satisfaction would be for each member to introduce one new adherent, as this would solve innumerable problems, including that of income.

MR. J. G. PEARCE (director and secretary) replied personally, and on behalf of his colleagues and the staff, to a vote of thanks voiced by Dr. Hartley and Dr. Hurst.

THE MECHANISED PRODUCTION OF ALUMINIUM GRAVITY DIE-CASTINGS FOR THE MERLIN ENGINE

Advantages of Gravity Die-Casting Over Sand Castings

By JOHN VICKERS

(*Continued from page* 283.)

Ageing

A more uniform and consistent effect is obtained if the castings are further heat-treated by artificial ageing, and to execute this treatment two batch-type ageing furnaces have been installed. The overall dimensions of these units are 12 ft. long by 7 ft. wide by 9 ft. high, the size of the heating chamber being 8 ft. 3 in. long by 4 ft. 4 in. wide by 3 ft. 6 in. high, and they are fired by producer gas, but so designed that they may be converted to town's gas with the minimum of loss to production.

The temperature within the furnace is pyrometrically controlled, two thermocouples being fitted in each heating chamber and the readings are recorded on a wall-type recorder mounted on each furnace. A high-speed fan recirculates the hot air throughout the charge of castings in such a manner as to ensure perfect uniformity of heat distribution.

By means of an endless chain passing over a pulley wheel on the structure immediately above, the doors are lifted and lowered with comparative ease, being fitted with balance weights. A bogie, loaded with castings contained in heat-treatment baskets, can be seen in Fig. 56, being pushed into one of these ageing furnaces. The castings are allowed to remain in the heating chamber for a predetermined time, resulting

TABLE I.—*Composition and Properties of Alloys in General Use.*

Alloy.	RR.50.	BSSL11.	BSSL11. + Mg.	BSSL33.	DTO.304.
Copper, per cent.	0.80—2.00	6.0—8.0	6.0—8.0	Nil	4.0—4.6
Nickel, per cent.	0.80—1.75	—	—	Nil	—
Magnesium, per cent.	0.05—0.30	—	0.15—0.25	Nil	—
Iron, per cent.	0.80—1.40	0.80 (Max.)	0.80 (Max.)	0.60 (Max.)	0.70 (Max.)
Titanium, per cent.	0.05—0.25	0.20 (Max.)	0.20 (Max.)	0.20 (Max.)	0.25 (Max.)
Silicon, per cent.	1.50—2.80	0.70 (Max.)	0.70 (Max.)	10.0—13.0	0.90 (Max.)
Manganese, per cent.	Nil	Nil	Nil	0.50 (Max.)	—
Zinc, per cent.	Nil	0.10 (Max.)	0.10 (Max.)	0.10 (Max.)	—
Tin, per cent.	Nil	1.00 (optional)	1.00 (optional)	Nil	—
Lead, per cent.	Nil	0.10 (Max.)	0.10 (Max.)	Nil	—
Total impurities, per cent.	—	—	—	—	0.20 (Max.)
Aluminium, per cent.	Bal.	Bal.	Bal.	Bal.	Bal.
Heat treatment—					
Temperature, deg. C.	155—170	155—175	350	None	160—170
Time, hours	8—16	8—16	20 mins.		12—16
Quench in.	Air	Air	Air		Air
Solution treatment—					
Temperature, deg. C.	None	None	None	None	525—545
Time, hours					12—16
Quench in.					Water at 80—100 deg. C.
0.1 per cent. Proof stress, tons per sq. in. (min.)	11.0—13.0	3.50	3.50	4.50	18
Ultimate stress, tons per sq. in. (min.)	13.0—16.0	7.50	7.50	10.50	24
Elongation, per cent. (min.)	4—6	1.50	1.50	5.00	6
Brinell hardness No.	60—80	50—80	80—110	50	80—120

Aluminium Gravity Die-Castings

in the acceleration of the precipitation of the micro-constituents by this form of artificial ageing.

This solution treating and ageing has the effect of considerably increasing the tensile strength of the aluminium castings, although the majority of the alloys at present in production in this foundry are such that the mechanical properties of the castings produced in them are sufficiently high to withstand the stress demanded of them by being subjected to the low-temperature artificial ageing treatment only.

On completion of this heat-treatment, the bogie-load of castings is withdrawn from the ageing furnace on to a bogie transfer carriage mounted on wheels to run on the traverse rail track in the 33 ft. 6 in. long pit which runs along the front of the furnaces. From this pit a rail track is run direct into the castings despatch stores, as can be seen on referring to the foundry layout (Fig. 23).

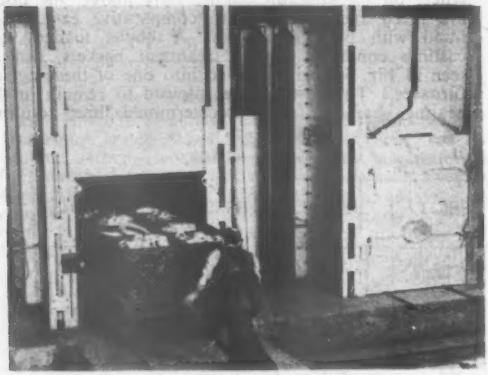

FIG. 56.—BOGIE-LOAD OF CASTINGS ENTERING AGEING FURNACE.

FIG. 58.—DIE MAINTENANCE SQUAD AT WORK.

Castings Despatch

The despatch stores are divided into two independent sections, *viz.*, quarantine and bond, and it is

FIG. 57.—CASTINGS BEING LOADED FOR DESPATCH TO MACHINE.

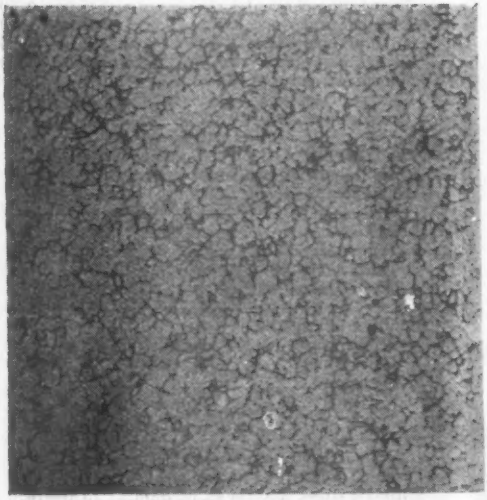

FIG. 60.—PHOTO-MICROGRAPH OF STRUCTURE OF RR.50 ALLOY. DIECAST. × 150.

into the first-mentioned that the castings are unloading from the heat-treatment bogie.

A release certificate must be received from the foundry control laboratory certifying that materially the castings are sound and to standard specification before a transfer can be made to the bond stores, where they will remain until requisitioned by the machine shops.

As a safeguard against any possible contingency, it has always been the policy of the management to hold in stock one month's requirements in excess of the current machine shop's requirements.

Die Maintenance

As previously explained in the "casting" section, one set of dies is used in production on one shift only, which enables the uninterrupted maintenance to be carried out on the dies during the following shift. By effecting this regular system of maintenance and minor repairs, long life is obtained from the dies and the possibility of mechanical breakdown, etc., is reduced to the absolute minimum, thereby considerably reducing the risk of a "hold-up" in the scheduled flow of production.

Material Inspection

The raw material in ingot form, prior to being released from the ingot stores for melting, is subjected to a check on the chemical analysis, the test being taken on a representative ingot from each particular melt in all consignments delivered to the foundry. It is imperative, in the interests of maximum production output, that, at all times, sufficient ingot material be released by the laboratory to ensure continuity of melting.

In order to cope with the large number of tests required each shift, it was agreed that the only possible solution was the installation of some form of mechanisation in chemical analysis, and for this purpose a Hilger medium quarts spectrograph (Fd. 60 cm.) was installed. The results obtained from this unit have already more than warranted the initial expenditure,

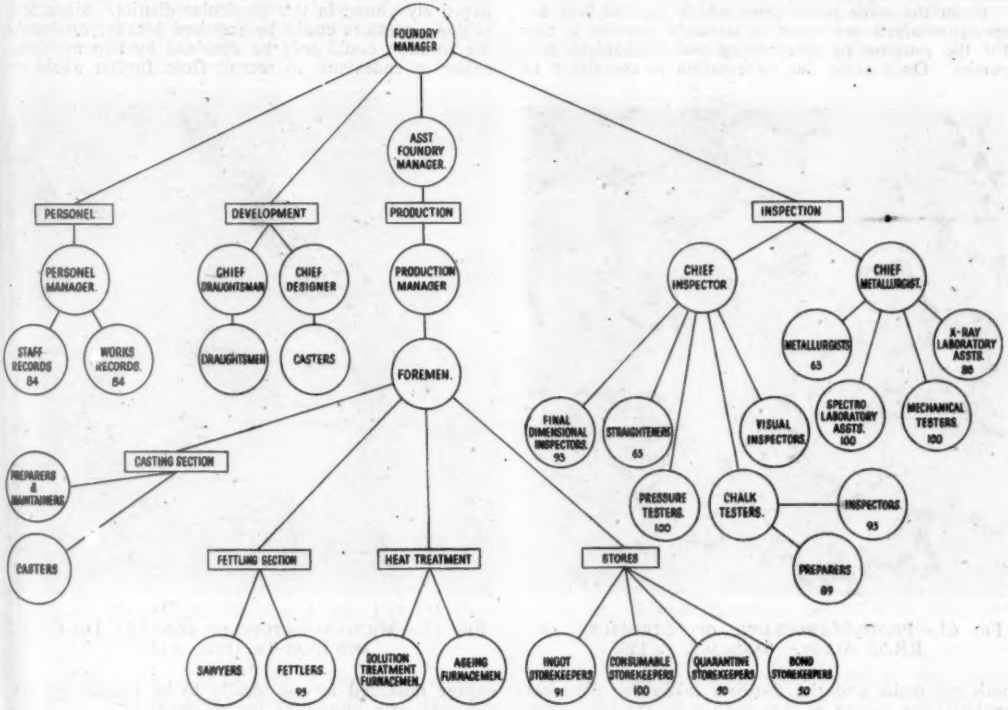

FIG. 59.

Aluminium Gravity Die-Castings

notwithstanding its valuable assistance in overcoming the difficulties of the present-day labour position.

Another service executed by this unit is the verification of the chemical composition of test-bars from a percentage of the various melts. The foundry control laboratory record details of the alloys cast and parts produced during a particular shift, and this information is correlated to the test-bars.

From the same melts from which the test-bars for spectro-analysis are taken, a standard test-bar is cast for the purpose of determining the mechanical properties. Once more the information is correlated to both the melts and the test-bars taken for chemical analysis; the release of the castings by the laboratory is fully dependent upon the results of these tests being satisfactory.

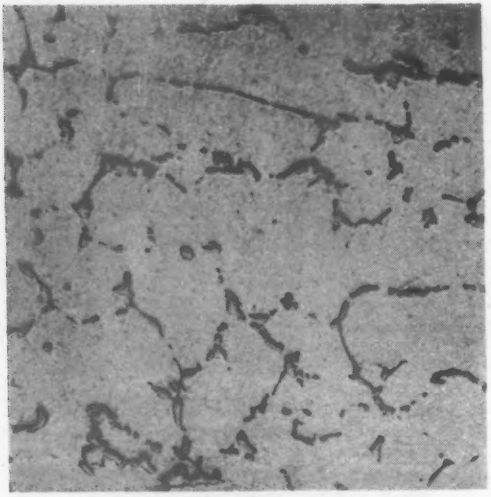

FIG. 61.—PHOTO-MICROGRAPH OF STRUCTURE OF RR.50 ALLOY. SANDCAST. ×150.

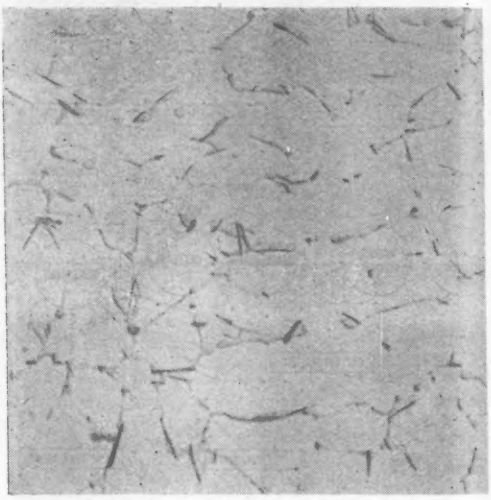

FIG. 62.—MICRO-STRUCTURE OF BSS L11 DIE-CAST AND HEAT-TREATED. ×150.

Radiological Inspection

Periodically representative castings of each engine part produced are collected at random by one of the metallurgists in attendance and submitted to the radiological department, where they are X-rayed by a staff of most efficient radiologists. Internal flaws, such as shrinkage, oxide inclusions, internal porosity, etc., not perceptible to the naked eye, are revealed under this inspection, and it is upon the results of this systematic check-up that comparative assurance is obtained that the production technique specified is being conformed to. The principal advantages of this procedure can be more fully appreciated from the more detailed account of the radiological examination policy appearing in one of the earlier sections, entitled "die development."

Personnel

At the inception of this die-casting foundry difficulty was experienced in obtaining the necessary skilled labour, as the production of high-class aluminium gravity die-castings is an industry which is comparatively young in this particular district. Since few skilled operators could be acquired locally, obviously the solution could only be obtained by two methods, either to endeavour to recruit from further afield or engage unskilled labour locally to be trained by the few craftsmen chosen as section leaders.

General wartime labour conditions accentuated prevailing difficulties, and it was decided that the only solution was to concentrate on the training of whatever labour was released by the Man-Power Board. Results have revealed that the perseverance expended by the administrative staff has effected a high standard of craftsmanship throughout all departments in the foundry. The ever-increasing rate of production is the outcome of the enthusiasm and splendid team spirit prevailing at all times among the workers.

Fig. 59 outlines the build-up of this organisation, and it will be noted how the productive responsibility has been assigned to ensure maximum efficiency from every section. The extent to which female labour has

been introduced can be gauged from the personnel statistics, which quote the figure of 45 per cent. of the total payroll to be female workers. The small numbers appearing in various circles in Fig. 59 represent the percentage female labour employed in each section; where no number appears, the personnel of that particular section consists entirely of males.

Conclusion

Five alloys are in general use in this light alloy gravity die-casting foundry, *viz.*, RR.50, B.S.S. L11, B.S.S. L11 + magnesium, B.S.S. L33 and D.T.O.304, having chemical composition and mechanical properties as detailed in Table I.

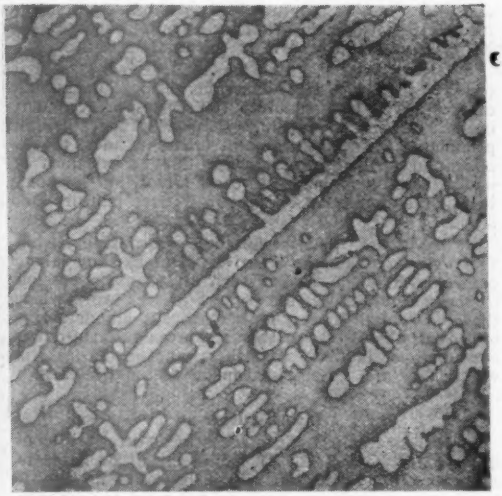

FIG. 63.—PHOTO-MICROGRAPH OF BSS L33 DIE-CAST MODIFIED STRUCTURE. × 150.

The first-mentioned, RR.50, is one of a range of complex aluminium casting alloys, and is a most suitable material for general sand and die-castings of the structural type where the property of rigidity and strength is desired. It possesses excellent castability, particularly when running intricately cored castings of widely varying metal sections. It machines freely, especially when heat-treated, has good bearing properties, and the titanium content in the alloy acts as a refining agent.

The fineness of grain size, brought about by the rapid cooling under die-cast conditions, is most distinct when a comparison is made of the photo-micrographs (Figs. 60 and 61). These show the structure of the alloy when heat-treated, revealing an intermetallic network round the aluminium-rich matrix. In its die-cast condition, the alloy exhibits very remarkable mechanical properties.

For parts of which hardness is the essential feature, the ideal alloy is BSS L11, which is a straight 7 per cent. copper-aluminium alloy possessing marked machinability. The addition of magnesium to this alloy makes it admirable for castings in which the best possible bearing properties are required. The photo-micrograph in Fig. 62 is a typical structure exhibiting copper aluminide in an aluminium rich matrix.

BSS L33 is a straight aluminium silicon alloy containing 10 to 13 per cent. silicon, and is susceptible to the phenomena known as modification. In the

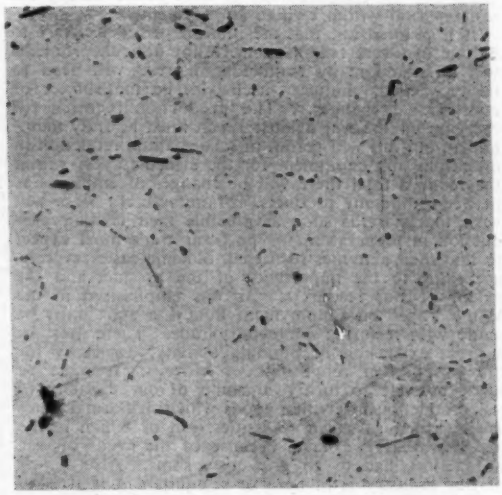

FIG. 64.—MICRO-STRUCTURE OF DTO.304 DIE-CAST AND FULLY HEAT-TREATED. × 150.

normal sand-cast form the eutectic is very coarse, the silicon occurring in relatively large needles, but when the alloy is modified by the addition of 0.1 per cent. sodium at 750 deg. C., the structure is remarkably refined. It possesses very marked fluidity and corrosion-resistance, and is used for producing castings having long thin sections, and also for parts required to withstand the action of corrosive agents.

Fig. 63 is a typical structure of the modified and die-cast alloy, showing white dendrites of primary aluminium in an unresolved matrix of aluminium silicon eutectic. In this condition, an increase in tensile strength of 20 per cent. and in percentage elongation of 100 per cent. is obtained over the unmodified alloy.

(*Continued on page* 307, *column* 2.)

DISTRIBUTION OF MAN-POWER

RE-ALLOCATION DURING INTERIM PERIOD

In the Government's White Paper on Re-allocation of Man-power between the Armed Forces and Civilian Employment it was pointed out that no general demobilisation either of the Armed Forces or of war industry could take place in the interim period and that the problem during that period would be one of re-allocation of man-power between the Forces and industry in order best to provide for the requirements of the situation. That paper described the Government's plans for the release of men and women from the Armed Forces during the interim period. In another White Paper now issued are set out the Government's plans for the redistribution of man-power during the same period within civilian employments.

It is pointed out that the interim period is likely to be one of severe readjustment. Many difficult problems will arise and many conflicting interests will need to be reconciled. Industry itself will be the subject of considerable changes. The production required for carrying on the war against Japan must be fully maintained, but this will permit of a substantial reduction in munitions and equipment for the armed forces; within the reduced total there will be changes of emphasis as between different products. Manufacturers who will wish to restart as soon as possible their civilian production in preparation for post-war trade must expect to find their activities restricted, in some cases severely, according to the importance of the product and the extent of our resources. As was emphasised in the White Paper on Employment Policy, a start must be made with restoring our export trade. There must be a great expansion in building activity, especially for the purpose of rehousing our citizens. It must be made possible to turn over some of our capacity to the production of civilian goods which in normal times are regarded as sheer necessities, but of which in the past few years we have, because of the needs of war production, had to go grievously short. Also, much of our industry is in need of re-equipment if it is to produce efficiently in the post-war period.

The task will be to ensure that our limited resources are concentrated first upon those munitions required for the armed forces, and, second, upon those products which are most important to national recovery and to an improvement in the standards not of those people who can pay the highest prices, but of the community as a whole. The existing system of allocating man-power to the forces and to the various industries, based on the annual man-power budget and carried out under the present system of priorities, will be continued.

Releases from the Forces

As regards resources of man-power, substantial numbers of men and women will be released from the Forces and Civil Defence, the majority of whom will be available for, and will require, civilian employment. At the same time some industries and establishments will be able to release workers, most of whom will need employment and should be steered to the employments where their services are most required in the national interest; many other industries and establishments which have had their labour forces depleted during the war will need to have their labour forces built up. Many employers will wish to make a start with building up their permanent labour force for the post-war period, but some of these employers will be engaged on work which is not for the time being of the first importance. As regards workers, many of them, on account of age or of exhaustion after years of severe strain, will wish and be entitled to retire from work altogether. Others will wish to take the earliest opportunity of getting themselves settled in permanent employment, a desire which may in many cases not be compatible with the need to employ them in the work carrying the highest priority for the time being. Finally, there is little doubt that throughout the period under consideration the minimum man-power requirements, on a basis not of luxury but for essential purposes, will be substantially in excess of the total resources.

"It is thus clear," says the White Paper, "that in order to avoid the risk of serious dislocation and the dissipation of our resources on objects of secondary importance and to ensure, so far as practicable, the production of necessities rather than luxuries, the re-allocation of man-power during this period must be undertaken on a planned basis involving in some measure a continuance of control over industry and labour."

In the man-power sphere the aim must be, while seeking to mitigate the severity of the existing labour controls and while paying such regard as is possible to the natural desires of workers to seek work where they please and of employers to engage labour freely, to ensure that the available resources of man-power are employed in the places where, and on the tasks in which, they are most needed in the national interest.

Priority Release

Compulsory enlistment in the armed forces will continue. Men aged 18 to 27 inclusive will be liable to calling up, but those over 25 will be called up only if the eight younger age groups do not yield enough men to meet requirements. Deferment of men with special skill will continue where necessary. In civilian employment certain classes of persons—grouped as the K class—whose retention in industry would be a considerable personal hardship will be allowed to retire immediately the war in Europe ends. They are:—Women, married or single, with household responsibilities and women wishing to join their husbands on release from the forces. Other women over 60. Men over 65. Women over 50 who wish to retire will be allowed to do so unless there are strong production reasons to the contrary.

All in Class K who do not wish to retire but desire other work or work nearer home and all others who have worked away from home for three years or more and want work nearer home will have first priority of release for transfer to work of importance, irrespective of the work on which they are engaged, or whether they are redundant, unless there are strong production reasons to the contrary

MODIFICATION BY HEAT-TREATMENT OF CAST STRUCTURES AND PROPERTIES

By Dr. H. T. ANGUS

Discussion on a Paper presented at the annual conference of the Institute of British Foundrymen. Mr. Daniel Sharpe occupied the chair. Dr. Angus's Paper was printed in our issues of October 19 and November 2.

MR. J. G. BAILES (Member), said the Paper brought out the point he had tried to make on Mr. Ruffle's Paper with regard to the Izod test, *viz.*, that he had never yet seen any tester use the Izod machine intelligently. There was no assurance that the base of the notch was accurate, which was the vital factor, and he had never seen anyone measure the depth between the base of the notch cross-section and correlate that with the result obtained. He agreed, however, that the Izod testing machine was excellent for giving certain information about shock resisting steels, if it were used properly.

Izod Values

DR. ANGUS, in reply to Mr. Bailes, referred to the Izod test, with particular reference to dimensional accuracy at the base of the notch. It was, of course, of great importance that Izod specimens should be machined to British Standards Specification limits and that gauges should be employed to check the base of the notch cross-section. The radius at the base of the notch was also of importance, and a constant check on the tools used should be made. Small variations in the width of the specimen up to 5 or 10 per cent. of the total area, in the Author's experience, affected the final Izod reading roughly in proportion to the change in area, but while in exceptional circumstances a figure could be given from an undersized specimen, it was most desirable that the standard limits should be adhered to.

The value of the Izod figure was a very difficult one to assess—there was a tendency to assume that a high Izod value was invariably a desirable property. It should, however, be borne in mind that in many cases the fatigue strength of a steel was reduced as the Izod value increased, and the choice of a material, purely on the basis of ultimate tensile and Izod, might lead to unexpected failures. In a general way, material with a high Izod value is desirable where relatively uncontrolled shock conditions were to be withstood, for example, anchor chains, crane hooks, etc., whereas high fatigue values frequently associated with low Izod figures should be used under shock loading of a controlled nature, as for example, car valves, springs, etc.

Keel Bar Test Results

MR. T. W. RUFFLE (Associate Member), remarking on the use of keel bars by the Author, said that a Paper was published some time ago by Kain and Dowson which showed the difficulty of getting three bars with similar properties. How many test-bars and from what position was the Author taking from his keel bars?

The AUTHOR said he only took the first 1¼ in. of the keel bar and used that for the tensile and Izod tests. If one used metal from further up the keel bar the results varied, among other things in an increase of inclusions.

MR. RUFFLE, continuing, said that his firm's experience with the keel bar was that it was very good for the bottom portion, but if several test-pieces were required then it did not give consistent results.

Early in the Paper, the Author stated that where two sets of opposing dendrites meet, there might be a very definite line of weakness, and it was rather implied that that could be removed by subsequent heat-treatment. Almost invariably, in his experience, under such conditions there would always be fine interdendritic unsoundness which no amount of heat-treatment would remove. The same remark applied to segregations. Where there were heavy segregations or even appreciable segregations of manganese, chromium or molybdenum, he did not think the difficulty could be removed commercially by heat-treatment. It was necessary to use a very high temperature and hold it for a very long time in order to disperse such segregations of heavy metals. In the case of the carbon-manganese steels—he had not brought it out very thoroughly in his own Paper—high carbon with high manganese sometimes gave very unsatisfactory results. He had been rather puzzled and, although he suspected segregations, he could not find any way of proving it. Since then the Author's very interesting Paper had appeared, and there had been another by G. A. Timmons in America, which dealt very thoroughly with segregations in manganese-molybdenum steel and demonstrated the trouble that could arise from heavy segregations of manganese. The ductility was very poor, and microstructures showed a definite grain boundary effect. Fissures started in the segregated, and therefore more brittle areas on the grain boundaries and a number of these fissures combining caused fracture.

Temperature of Water for Quenching

With regard to water quenching, the Author quenched at 60 deg. C., which seemed rather warm for practical working. If there was a large amount of work to be treated, it would be found that starting from 60 deg. C., the water would soon become uncomfortably hot. Another point which was regarded as very important was that tempering should

Modification by Heat-treatment

be carried out immediately after quenching. He had been very fussy about that for a while, but it was often very inconvenient and, in point of fact, had found in his own case that it did not matter if the steel was allowed to stand for a week after quenching and before tempering. With higher tensile steel it was necessary to be much more cautious than with light alloy steel and straight medium carbon steel. The latter could be quenched in cold water and allowed to stand until one was able to temper. Unless the casting was a difficult shape there would not be any trouble with cracking.

At Braintree they had discussed this Paper at some length, and they did not feel very happy about the remarks that dendritic structure was associated with the amount of inclusions. The Author seemed to imply that if the inclusions were considerable the dendritic structure was more pronounced, but personally he had not observed much to support that argument. He believed that dendritic structure was more largely concerned with temperature gradients in cooling.

Centre Line Dendrites

The AUTHOR, replying on the question of centre-line dendrites, said that Fig. 6 of the Paper was taken from a casting in which the finished section was only about 20 per cent. in excess of the final width of the bar, and he could say definitely that where that occurred there were no inter-dendritic fissures. There was possibly something in the composition, production or cooling of the steel which had caused the excessive development of the dendritic structure. He was not too clear in his own mind why steels cast under apparently identical conditions should, in some cases, produce big dendrites and, in other cases, small ones, and when he said he considered dendritic segregation to be, to some extent, associated with inclusions, he was rather drawing on his own experience and interpreting what he had seen in the literature, although he was not satisfied there was a direct connection between them. His impression was that where coarse dendrites were associated with inclusions, the carbon segregation was much more difficult to disperse than was the case when the inclusions were not present. Benedicks and Löfquist had indicated that inclusions were not necessarily to be regarded as a neutral, extraneous phase floating about freely, but might be part of the general equilibrium of steel, and that might have some bearing on the dispersal of the structures.

He entirely agreed with Mr. Ruffle that segregations of silicon, phosphorus and manganese were almost impossible, commercially, to remove by heat-treatment, but it was possible sometimes to resolve the carbon segregation which followed from them, and that was his primary reason for normalising at higher temperatures, in that it seemed to facilitate carbon dispersal.

As regards water quench temperatures, his water-quenching equipment had proved exceedingly efficient. It was arranged to give even quenching, and there was initially more difficulty in keeping the temperature of the quenching water up. There had been no difficulty in maintaining the temperature between 60 and 70 deg. C.

He was rather surprised at Mr. Ruffle's statement that low alloy steel castings could be safely held for some time in the hardened state before tempering. On one occasion he made a certain amount of carbon manganese steel containing 1.4 per cent. manganese and 0.4 per cent. carbon, and also some manganese-molybdenum steel, and was unfortunate in that the heat-treatment plant was out of commission. Some of the material was dealt with in another plant in mid-winter, and was transported in the hardened state to be tempered, and the percentage of cracks rose alarmingly. That was one reason why he always insisted on the hardened material being stored in as warm a place as possible and tempered within four hours of being hardened. Perhaps in the case of the lower carbon steel mentioned in the Paper that was not so necessary, but he had come to the conclusion that low alloy steels were safer if they were tempered as soon as possible after hardening.

Inclusions and Size of Dendrites

MR. W. D. PUGH (Member), referring to dendrites, said the firm he was associated with had, at one time, to deal with a large number of ingots for aircraft purposes which were sectioned, macro-etched and subsequently accepted or rejected on micro-examination for cleanliness. Their experience had been that there was no relation between the amount of inclusions and the size of the dendrites.

With regard to tempering after hardening, he suggested that while it was not desirable to delay the tempering operation, it would be quite practicable in the cases of very small forgings to leave them for an indefinite time. Depending on composition, it was necessary, as the size of the job and its intricacy increased, to take greater care to avoid trouble, and it was not possible to lay down hard-and-fast rules.

The AUTHOR said he did not appear to have made himself quite clear about inclusions and dendrites. He was not of the opinion that inclusions produced large dendrites, but that they were associated with a dendritic structure which was more difficult to disperse by heat-treatment.

MR. W. H. SALMON (Member), referring to Fig. 6, which showed abnormal tensile fracture carrying interlocking opposed dendrites in a medium carbon steel, said it was unusual to see such a structure in a test-bar, unless the feeder head had been placed in the middle of a horizontally cast keel block and the tensile test-piece cut too high, that is, from the zone which contained the segregates and minute shrinkages. If an ample feeder head had been placed over one end of the bar, that is, over the "gripped" or threaded portion of the test-bar, instead of over the centre of the parallel portion of the tensile bar, the fracture would have been better.

The AUTHOR said the statement in the Paper with

regard to Fig. 6 was not quite accurate. The tables later were results from steel bars, but this photomicrograph was actually taken from a casting and not from a keel bar. The type of keel bar used was massive, with a feeding head over its entire length, but he never used more than the lower portion of a keel bar for his tests.

Incidence of Temper Carbon

MR. H. E. CRIVAN (Associate Member) asked for a further explanation of the Author's ideas with regard to the production of temper carbon and increasing the soaking temperature. What was said in the Paper in this respect did not bear out his experience with blackheart malleable cast iron. In the same way, the statement in the Paper with regard to the production of temper carbon in silicon steel did not fit in with his experience with 3 per cent. carbon cast iron.

The AUTHOR replied that the production of temper carbon from high silicon, high carbon steel puzzled him at first, but he thought the answer was this: If the casting were taken up to about 860 deg. C., it was not quite correct to say that temper carbon was not produced, but rather that the temper carbon was not retained. It might be produced by the breakdown of the cementite, but was re-absorbed into the austenite rather more quickly than it was formed from the cementite. At about 820 deg. C. it was formed from the cementite quicker than it was absorbed by the austenite.

His statement with regard to the production of temper carbon in silicon-free steel was not based on his own experience, but was taken from one of the references given in the Paper, *viz.*, Greiner, Marsh and Stoughton, who quoted that a prolonged annealing of 0.2 per cent. silicon steel brought about the breakdown of cementite to temper carbon. It was not his own personal observation.

The Removal of Dendritic Formation

DR. C. J. DADSWELL, B.Sc. (Member), expressed the view that the persistence of dendritic formation is related to the inclusions. It had been his experience with acid electric steel to go through a period of great trouble with low ductility. It was found that this was associated with persistent dendritic structure and it had been necessary to go to 1,000 deg. C., in homogenising, followed by normalising or annealing in order to pass the physical tests imposed. Even then it was only rather a scrape through; the steel was never equal to good steel. In the end, the solution was found in the steel-making, and the difficulty was found to be associated particularly with the thermal history during the melting, boiling and refining. He had mentioned this instance before as being an excellent example in which the immersion pyrometer had been of the greatest value in steel-making. It was only through the temperature recording that it had been possible to trace the trouble and so avoid the low ductility.

(*Continued at foot of next column.*)

CALL FOR RELEASE OF E.P.T. CREDITS

The National Union of Manufacturers is asking the Government to release some portion of Excess Profits Tax credits for the purchase of additional machinery for post-war requirements, citing especially the hardships of firms with low profit standards. A resolution to the Chancellor of the Exchequer states:—

"The National Union of Manufacturers expresses its gratification to the Chancellor of the Exchequer for the concessions given in the Finance Act, 1944, in raising the allowance for the Working Proprietor's Standard, but considers that further consideration should be given in framing future legislation to the many cases of hardship suffered by businesses with a low pre-war standard of profits. They therefore urge that in the interests of future employment and the export trade, every assistance should be given to such cases to assist their post-war equipment and organisation. Also, in view of the probable easing of Government requirements for machinery, they respectfully urge that an immediate release of some portion of the Excess Profits Tax credit be given for the purchase of additional machinery by manufacturers for post-war requirements.

THE MECHANISED PRODUCTION OF ALUMINIUM GRAVITY DIE-CASTINGS FOR THE MERLIN ENGINE

(*Continued from page* 303.)

For highly stressed components which would normally be manufactured as forgings, castings are now produced in D.T.O.304 alloy, which is a complex high-duty aluminium casting alloy of the solution and precipitation heat-treatment type. Due to the inherent chilling action, die-casting this alloy greatly facilitates complete heat-treatment. Fig. 64 shows broken copper aluminide network in a matrix of aluminium rich solid solution.

In conclusion, the Author wishes to thank the directors of Rolls-Royce, Limited, and also the Ministry of Aircraft Production, for their kind permission to publish this Paper.

(*Continued from previous column.*)

Continuing, Dr. Dadswell said he was pleased this Paper had been presented because he had been associated with the Author's work during this war and knew the work that he had done. The steels referred to had been used for tracks for tanks, and it was a great credit to the Author for the manner in which he tackled the problem. The Author's foundry had been making high carbon material of over 1 per cent. C. and, without any experience they changed over to these more normal carbon and carbon-manganese steels.

A cordial vote of thanks was given to Dr. Angus at the conclusion of the discussion.

PERSONAL

MR. ESSINGTON LEWIS, Director-General of Munitions and Director-General of Aircraft Production in Australia, has arrived in London.

MR. JOHN ALLAN MILLAR, treasurer of Dorman, Long & Company, Limited, has been appointed a special director of the company. He is a director of Redpath, Brown & Company, Limited, and in May last year joined the board of the Tees-side Bridge & Engineering Works, Limited.

MR. D. A. THOMPSON, recently appointed to the board of directors of the African Manganese Company, Limited, has been general manager of their mines at Nsuta, Gold Coast Colony, for some years. As president of the Gold Coast Chamber of Mines he has done much to advance the social welfare of the Africans and Europeans resident in that Colony.

MR. COLIN LAYCOCK, chairman and managing director of J. Beardshaw & Son, Limited, steel rollers, of Sheffield, is to be presented with his portrait in oils by members of the staff to mark his 50 years' association with the company. He is a former president of the Sheffield Chamber of Commerce. He began his career with the company at the age of 15.

MR. GEORGE ALBERT URE, J.P., chairman and managing director of Smith & Wellstood, Limited, Bonnybridge, was appointed to the board in November, 1894, and his service as a director, therefore, now covers a period of fifty years. To mark the occasion, Mr. Ure received a presentation from the directors at a recent board meeting, and at a meeting held in the works Mr. and Mrs. Ure were presented by the employees with pastel portraits by Mr. Tom Purvis.

SIR LLEWELLYN THOMAS GORDON SOULSBY, J.P., of Cardiff, has been elected a director of Stothert & Pitt, Limited. He is a director of the Bristol Channel Employers' Mutual Accident Indemnity Association, Limited, and managing director of Mountstuart Dry Docks, Limited, Barry Graving Dock & Engineering Company, Limited, and Cardiff Channel Dry Docks & Pontoon Company, Limited. He is Regional Director, Merchant Ship Repairs, for the Bristol Channel district, and also the North West England area.

MR. EDWARD THOMAS JUDGE has been appointed a special director of Dorman, Long & Company, Limited. Now the company's chief technical engineer, he made his first contact with engineering as an apprentice fitter with the Wellman Smith Owen Engineering Corporation, Limited, Darlaston, in the period between leaving Worcester Royal Grammar School and entering St. John's College, Cambridge. In 1930, he passed with honours the Mechanical Sciences Tripos examination, and the same year joined Dorman, Long & Company, Limited, as a trainee. In 1937, he was appointed chief technical engineer in charge of the central engineering department. He is familiar with iron and steel works plants throughout the country, in pre-war Europe, and the U.S.A., where he has studied the latest developments in American iron and steel practice.

MR. A. MACLEOD, who joined Dorman, Long & Company, Limited, as an apprentice, and is now commercial manager, has been appointed a special director of the company. Following service in H.M. Forces in the last war, Mr. MacLeod continued in the Territorial Army, and commanded the 50th Divisional Signals from 1924-30. He became deputy Chief Signal Officer, Northern Command, retiring in 1932 with the rank of Brevet Colonel, Royal Signals. Mr. MacLeod returned to Dorman, Long in 1919, and was engaged on the installation of new steelworks plant and mills. Later, he spent a considerable time on the Continent. Transferring to the commercial side of the company's organisation in 1930, he later became responsible for their sheet interests. In this capacity Mr. MacLeod took an active part in the organisation of the sheet trade, in which he has been for a number of years a well-known figure. He is a member of the Sheet Makers' Conference. Following the retirement of Mr. J. A. Russell at the end of 1941, Mr. MacLeod was appointed commercial manager of Dorman, Long & Company, Limited, bringing to this position a combination of extensive engineering and commercial experience.

MR. R. A. HACKING, who joined the research department of Dorman, Long & Company, Limited, in 1938, has now been appointed a special director of the company. Since November, 1941, he has been controller of production at all Dorman, Long iron and steel works. A Lancashire man, Mr. Hacking began his industrial career in the laboratory of the Darwen & Mostyn Iron Company, Limited, studying at the College of Technology, and later at Victoria University, Manchester, where he obtained the degree of B.Sc. with first class honours. He was the first metallurgical graduate of Manchester University to be awarded an Industrial Bursary by the Commissioners of the 1851 Exhibition. Returning to the Darwen & Mostyn Company for two years, Mr. Hacking transferred to the Park Gate Iron & Steel Company, Limited, Rotherham, becoming blast-furnace manager in 1926, and, two years later, chief metallurgist in succession to Dr. T. P. Colclough. In this capacity Mr. Hacking gained an intimate knowledge of the special steel trade in the Sheffield district. In 1931, he obtained by thesis the degree of M.Sc. Mr. Hacking has for many years been an active member of several technical committees of the British Iron and Steel Federation, the Iron and Steel Institute, the British Standards Institution and other bodies. He is a member of the Council of the newly constituted British Iron and Steel Research Association.

Wills

CROFT, J., of Stourbridge, galvanised hollow-ware manufacturer	£42,481
MARTYN, C. V., of Staunton, Gloucestershire, iron ore merchant	£36,299
LE TALL, G. M., of Sheffield, director of Watson Saville & Company, Limited	£1,272
NUGENT, MAURICE, of Dublin, director of the Hammond Lane Metal Company, Limited	£4,673
SUMMERS, WALTER, of Rutland Gate, London, S.W., a director of John Summers & Sons, Limited ...	£66,430
WILLIS, J. M., of Ashby-de-la-Zouch, managing director of Rawdon Foundry & Engineering, Limited	£17,397
HARLEY, ANDREW, of Coventry, foundry manager of the Daimler Company, Limited, motor-vehicle manufacturers, founders, etc.	£3,781

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COMPANY RESULTS

(Figures for previous year in brackets.)

John I. Thornycroft—Net profit, £128,685 (£153,334); ordinary dividend of 13% (same); forward, £110,718 (£105,533).

Shotts Iron—Profit to September 30, £64,617 (£62,688); dividend of 5% (same); depreciation, £35,000 (same); to reserve, £10,000 (same); forward, £43,260 (£40,123).

Carrier Engineering—Net profit, £91,380 (£89,697); taxation, £24,737 (£29,194); preference dividend, £3,000; ordinary dividend of 25% (same); reserve, £15,000 (£10,000); forward, £113,856 (£107,401).

Mitchell, Shackleton—Profit for the year ended September 30 last, £37,306, after including a sum to be recovered on account of E.P.T. paid previous years (net profit, after provision for taxation, £33,105); dividend of 12½% (same).

Edward Wood & Company—Trading profit to August 31 last, £39,620; depreciation, £4,688; net profit, £34,932 (£37,625); taxation, £18,000 (£20,000); deferred repairs, £3,000; dividend of 9% on the ordinary shares (same); to employees under profit-sharing scheme, £2,500; forward, £23,520 (£21,188).

Cannon Iron Foundries—Trading profit for the year to June 30, 1944, after charging all expenses, £81,284 (£105,267); taxation, including income-tax payable January 1, 1946, £45,501 (£67,763); war damage contribution, £487 (£728); net profit, £35,296 (£36,776); final dividend on the ordinary shares of 5%, making 10% (same).

Lake & Elliot—Trading profit, after taxation, to July 31 last, £34,119 (£39,716); depreciation, £8,250 (£7,525); pension scheme, £2,831 (£2,357); net profit, £19,370 (£24,086); preference dividends, £4,219 (£4,290); capital redemption reserve, £2,966 (£2,824); ordinary dividend of 20% (same); reserve for future taxation, nil (£34,581); forward, £41,382 (£34,197).

Walmsleys (Bury)—Net trading profit for the year to September 30, after depreciation and war risks insurance, £79,170 (£78,680); dividend from a subsidiary, £8,577; balance after making provisions for employees' pensions, income-tax and N.D.C., £63,031 (£60,800); dividends on preference share capital, £13,000; dividend of 14½% on the ordinary shares (same); forward, £122,789 (£116,258).

Tube Investments—Trading profits of the subsidiaries (excluding one overseas) for the year to July 29 last, after E.P.T., £2,345,038 (£2,271,185); depreciation, £248,382 (£259,319); research and development, £300,000 (nil); special depreciation and contingencies, nil (£200,000); reserve against stock values, nil (£150,000); profits retained by subsidiaries, £23,963 (£21,739); income-tax, £1,084,812 (£1,069,339); net balance, £680,263 (£565,106); dividends from allied companies, £92,319 (£77,296); from general investments, £27,362 (£27,856); other receipts, £26,954 (£18,044); net credit balance, £824,048 (£685,152); general reserve, £100,000 (same); contingencies, nil (£100,000); dividend stabilisation fund, £250,000 (nil); ordinary dividend of 22½% (20%); forward, £274,166 (£251,641).

OBITUARY

SIR JOHN CAMPBELL, chairman of the International Tin Committee, died on December 3, aged 70.

MR. ALBERT T. J. PIKE, former manager of William Jacks & Company, Limited, at Shanghai, died in hospital at Shanghai on May 29 last, it is announced.

MR. HAROLD JOHN DE Q. LENFESTY died recently at the age of 63. He was a director and secretary of John Thompson (Kennicott Water Softeners), Limited, one of the subsidiary companies of John Thompson Engineering Company, Limited, Ettingshall. He had been with the company since 1912.

MR. HENRY ALOYSIUS DAVIES, director and general manager of the Patent Shaft & Axletree Company, Limited, Wednesbury, died recently, in his 71st year. Mr. Davies joined the Patent Shaft & Axletree Company in 1886 at the age of 14, and having served in various departments, he became works manager and later general manager of the company. He was a member of the council and executive committee of the British Iron and Steel Federation. He was appointed a borough magistrate in 1925, and in 1937, when Mr. Davies had completed 50 years' service with the Patent Shaft Company, his name was added to the roll of honorary freemen of Wednesbury.

EXTRA CLOTHING COUPONS FOR WORKERS

Many classes of manual workers will again receive ten extra coupons in the current rationing period. The trades and occupations eligible for this supplement are the same as in the last rationing period, and are set out in the leaflet called " The Industrial Ten " (T.C.45). This is now obtainable—by employers, self-employed workers and trade union officials—from local offices of the Ministry of Labour and National Service. Employers are asked to post copies on works' notice boards.

Employers should obtain a supply of application forms from the local office of the Ministry of Labour and distribute them to their employees. As soon as these forms have been filled in and returned to him, each employer must make a collective application for the total number of coupons required.

CERTAIN SCRAP RESTRICTIONS WITHDRAWN

The Minister of Supply has made the Control of Iron and Steel (No. 36) Order, 1944, which came into operation on Friday last. The Order withdraws (1) the restrictions on the treatment, use, and consumption of ingot mould scrap and tramway rails, and (2) the obligation to segregate scrap steel containing tungsten.

Copies of the Order may be obtained from H.M. Stationery Office, price 1d. (S.R. & O., 1944, No. 1335).

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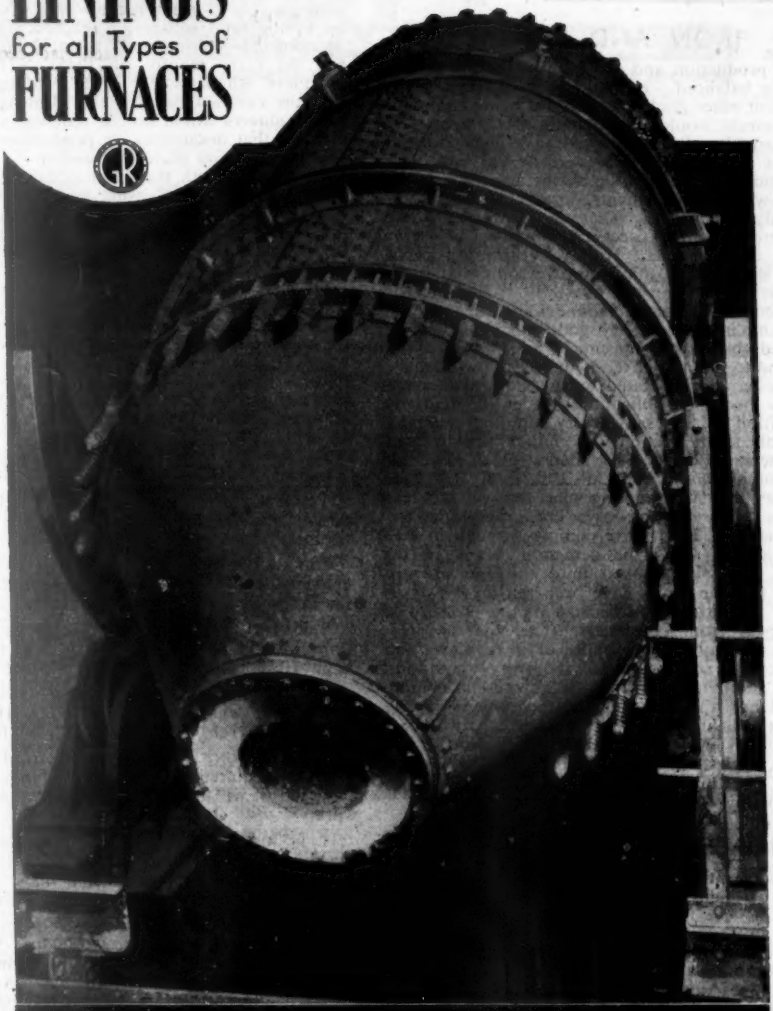

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Raw Material Markets

IRON AND STEEL

Current production and consumption of pig-iron are very evenly balanced. Hematite, of course, is scarce, and although other grades of iron are being commonly used, consumers would undoubtedly prefer hematite if it were available. But all other irons—high- and low-phosphorus as well as refined iron—are obtainable under licence, and regular deliveries are reaching the foundries, whose requirements, in some instances, are on a slightly better scale. There is at present no difficulty in procuring the necessary supplies of scrap, either cast iron or steel. However, there are indications that the demand may improve somewhat in the near future.

Coke is coming through to foundries reasonably well, and in many instances fairly good stocks have been accumulated, but some consumers will be forced to rely on hand-to-mouth deliveries during the winter.

The re-rollers are allocated by the Control tonnages sufficient to meet their obligations and, in the main, the supply position is fairly satisfactory, although increased tonnages of small sections of billets are wanted. With the increased demand for shell steel, there should later be supplies of shell discard steel available. The re-rollers are accumulating what reserves they can in defective billets, double-sawn crops and other re-rollable steel. Sheet bars are coming through in adequate tonnages to meet the demand. Many of the sheet mills are fully booked until the end of next period and tonnage limits have been put on the stockholders for the next period because of the pressure of direct business from consumers. There is no great call on the steelworks for supplies of thick plates and heavy structural sections. All the works could do with much more tonnage than is at present coming through. Until there is some improvement in the shipbuilding industry, the plate makers cannot expect much additional business. The dearth of orders for heavy joists, angles, channels, etc., is due to the absence of wartime structures and the fact that civil building is not yet permissible.

NON-FERROUS METALS

There has recently been a call for an increase in the production of shells, both in the United States and Great Britain. As it is possible that there is also a stepping-up in the manufacture of other military requirements, there may be entailed an appreciable expansion in the amount of copper and brass consumed. However, it does not seem that there is any general expansion of the scale of war production, and it is not likely that the gap between falling output on war account and the limited amount of civilian manufacture allowed to be undertaken will be greatly reduced. Although quite a few restrictions have now been relaxed, the amount of work that can actually be taken on is governed by several factors, chief among them being the shortage of labour.

Negotiations with the Empire copper producers on the question of the renewal of contracts are still in progress. So far no definite news has been received as to the final settlement reached. The need for an agreement is becoming increasingly urgent, at any rate for the early months of 1945. The Governor of Northern Rhodesia, Sir E. J. Waddington, has stated that the contract between the Ministry of Supply and the producers would not be renewed after February 1. He said that discussions on production figures for next year were taking place in London.

In contrast with the other non-ferrous metals there is little possibility of easing the restrictions on the use of tin for some time. Even the defeat of Germany will not bring much immediate relief in the position. It is impossible to foresee how long it will be before the Eastern producing areas are freed, and production on a large scale will not be able to be carried on for a considerable time after that.

Sheet lead and lead pipe of all sorts may now be used without any restrictions for building and repair work. This news is very welcome, as hitherto the releases made have been extremely limited. There is likely to be a heavy call for lead in the housing programmes shortly to be embarked upon.

NEWS IN BRIEF

TEMPLEGATE FOUNDRIES, LIMITED, is being wound up voluntarily. Major Whitby Jervis, 118, Colmore Row, Birmingham, 3, is the liquidator.

POPLAR ENGINEERING, LIMITED, is paying a first and final dividend of 3s. 6d. in the £ on December 18 at 18, Essex Street, Strand, London, W.C.2.

STANSTED AGRICULTURAL ENGINEERS, LIMITED, is being wound up voluntarily. Mr. F. N. Phipps, 329, High Holborn, London, W.C.1, is the liquidator.

BRITISH NITROGEN ENGINEERING, LIMITED, is being wound up voluntarily. Mr. D. Q. Holland, Crown House, Aldwych, London, W.C.2, is the liquidator.

THE CHALFONT PARK HOTEL, Gerrards Cross, Bucks, has been acquired by the British Aluminium Company, Limited. It will be used for research and experimental work.

IT IS ANNOUNCED that the share capital of Muir Machine Tools, Limited, of Manchester, a century-old gear-making firm, has come under the control of David Brown & Sons (Huddersfield), Limited.

IT COSTS John I. Thornycroft & Company, Limited, shipbuilders and engineers, £5,000 per year to collect pay-as-you-earn taxation from their employees. The chairman of the company, Sir J. E. Thornycroft, suggests that the authorities should reimburse employers for costs so incurred.

THE NEED for degree courses in technology is urged in a report prepared by a conference of local education authorities representing London and the Home Counties, which will form the basis of their evidence to be submitted to the Departmental Committee on Higher Technological Education.